

Boosting Innovation and Productivity in Enterprises: What Works?

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Outline

- Policy Challenge and Key Questions
- Analytical Framework
- International Empirical Evidence
- Irish Empirical Evidence
- Policy Issues

Policy Challenges

- Economic growth and higher employment require more sustainable enterprises
- **Innovation** at enterprise level is essential for
 - productivity
 - competitiveness
 - sustainable growth
- We need effective government policies to cope with tight fiscal constraints

What is Innovation?

“the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace or external relations”.

Oslo Manual (OECD, 2005), third edition, p.46

Context for Innovation

- Innovation takes place in a global context
 - *New players, global networks of innovation*
- Innovation takes place at enterprise level
 - *Enterprise characteristics and performance vary within and between industries*
- Understanding determinants of innovation and productivity at enterprise level is key to designing effective innovation policies

Key Questions



- Is innovation linked to higher productivity?
- Which types of enterprises invest in innovation?
- Which enterprises have higher innovation investment per employee?
- Which types of enterprises are more likely to innovate successfully?
- What is the government's policy role in enhancing enterprise innovation?

Methodology



- Develop the analytical framework
- Review recent international/national econometric evidence on enterprise innovation and productivity
- Generate new evidence about Irish indigenous enterprises
- Derive key policy messages and explore them in the context of current policies

Analytical Framework

**Enterprise size,
market power
and innovation**

**Innovation
systems**

**R&D investment,
knowledge spillovers
and productivity growth**

**International trade
with heterogeneous
enterprises**

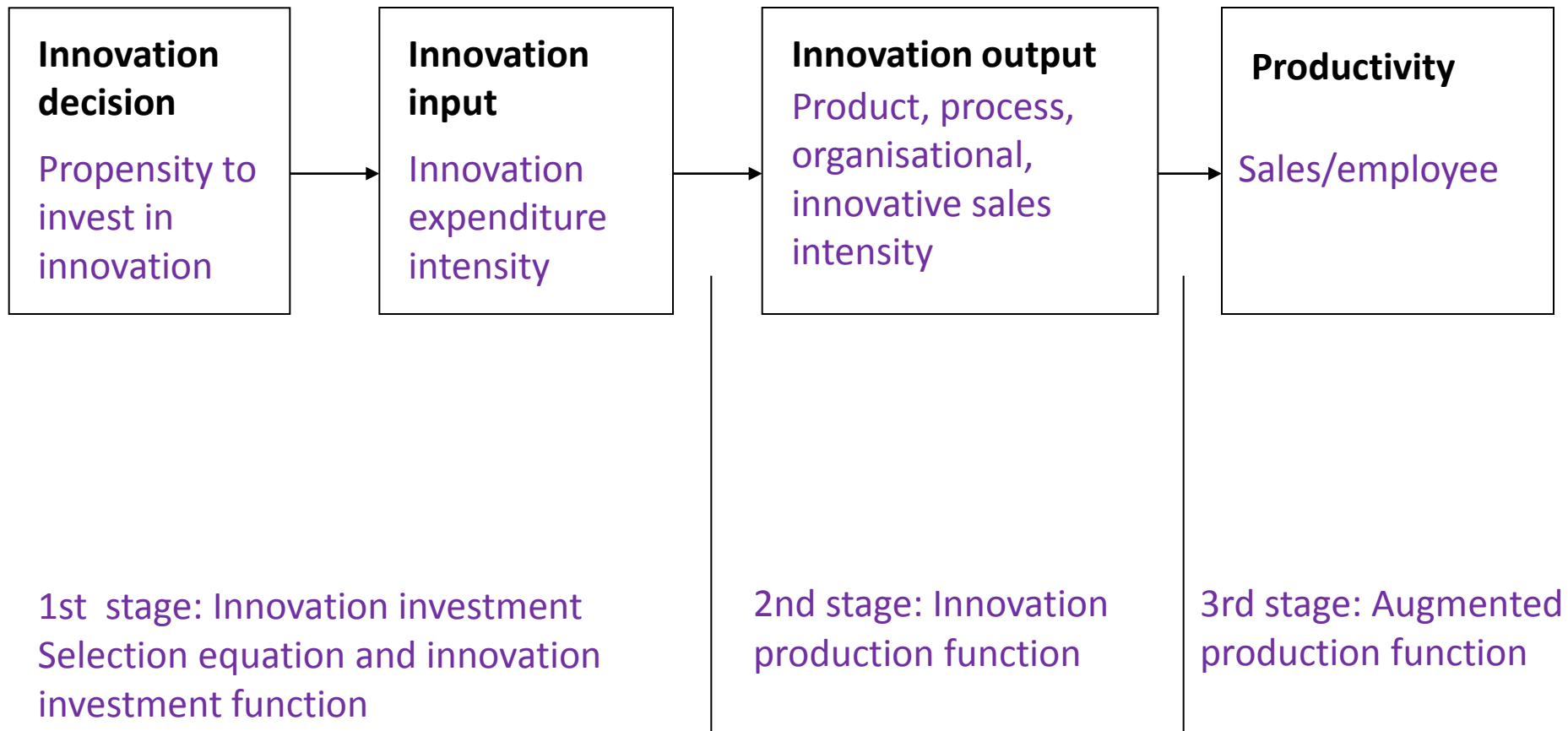
Analytical Framework

- Industrial organisation: Schumpeter (1942); Sutton (1998)
 - *Firm size, market structure and R&D; R&D and firm growth*
- Endogenous growth: Griliches (1984); Romer (1990); Aghion and Howitt (1998)
 - *Productivity growth is endogenous; private R&D investment and knowledge spillovers affect productivity growth; government can foster innovation and growth*
- Innovation systems: Freeman (1987); Lundvall (1992); Nelson (1993)
 - *R&D and non-R&D influences on innovation*
 - *Role of institutions and organisations*
 - *Role of interactive learning*
 - *Role of interactions between agents*
- Firms and global trade: Bernard and Jensen (1995); Melitz (2003); Helpman et al (2004)
 - *Low productivity firms serve only domestic markets; most productive firms export and invest abroad*

Empirical Evidence

- Explores links between innovation investment, innovation outcomes and productivity
- Based on an econometric framework developed by Crépon, Duguet and Mairesse (1998) - the CDM model
- Use of Community Innovation Surveys – from developed European countries
 - Large countries: France, Germany, Italy, Spain, United Kingdom
 - Small countries: Austria, Belgium, Denmark, Finland, *Ireland*, Luxembourg, the Netherlands, Norway, Sweden Switzerland

Innovation and Productivity: Empirical Framework: CDM* Model



Based on the Crépon-Duguet-Mairesse (1998)

International Evidence: Is Innovation Linked to Higher Productivity?



- Innovation output at enterprise level is positively linked to productivity – robust country evidence
- **Main Channels**
 - New and/or improved goods and services
 - Efficiency improvements due to process and organisational changes

International Evidence: Which Enterprises Invest in Innovation?



Investment Propensity

Larger enterprises

With export markets

With higher innovation capability

With formal and strategic
protection of intellectual property

Receiving public funding

Investment Intensity

Smaller enterprises

International Evidence: Which Enterprises Innovate Successfully?



- Larger enterprises
- With higher R&D/innovation expenditure per employee (mainly for product innovation)
- Engaged in co-operative innovation activities

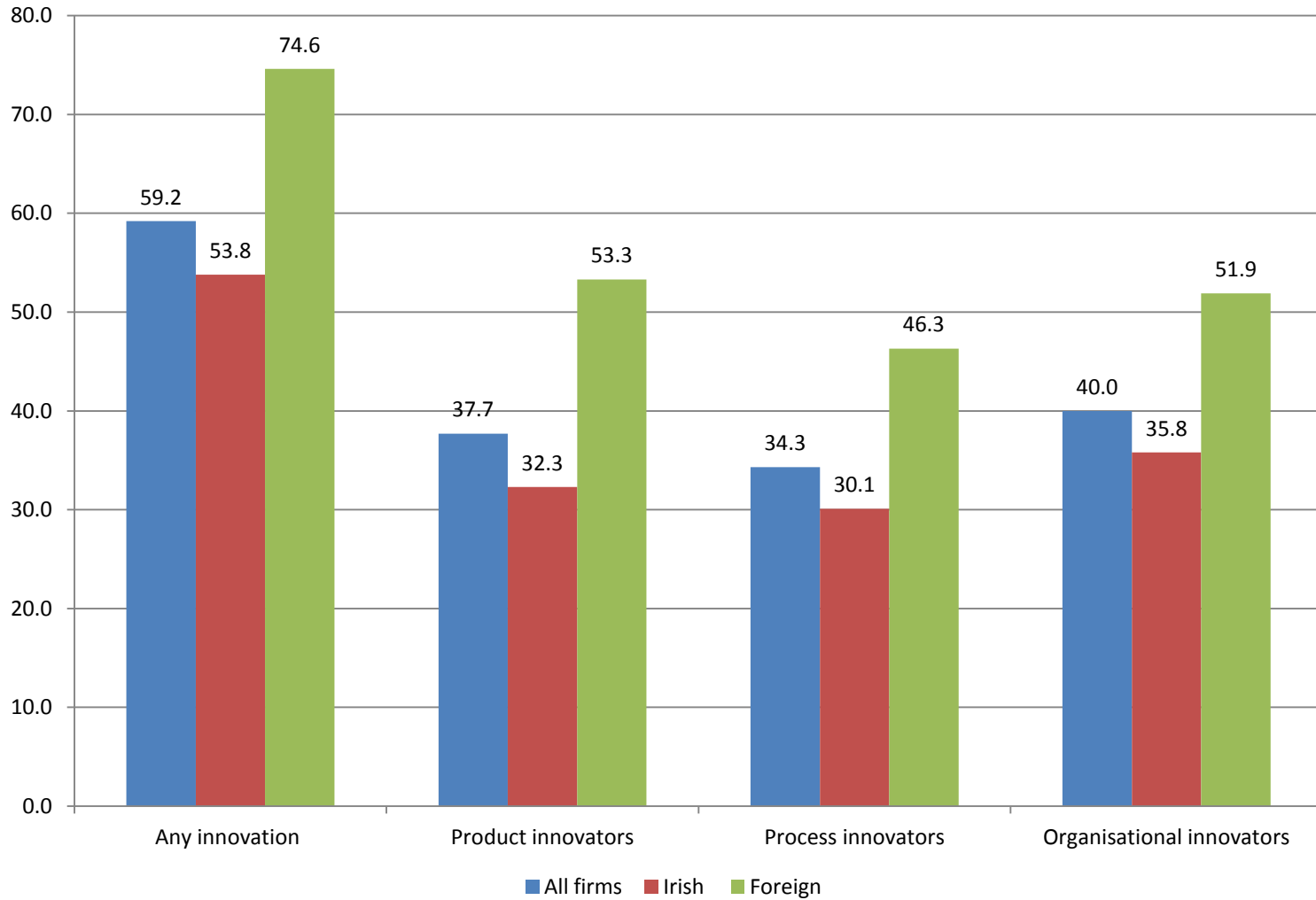
Irish Evidence



- **Ireland's Dualistic Economy:**
 - Indigenous and FDI enterprises
 - Modern and traditional sectors
 - Exporting and non-exporting

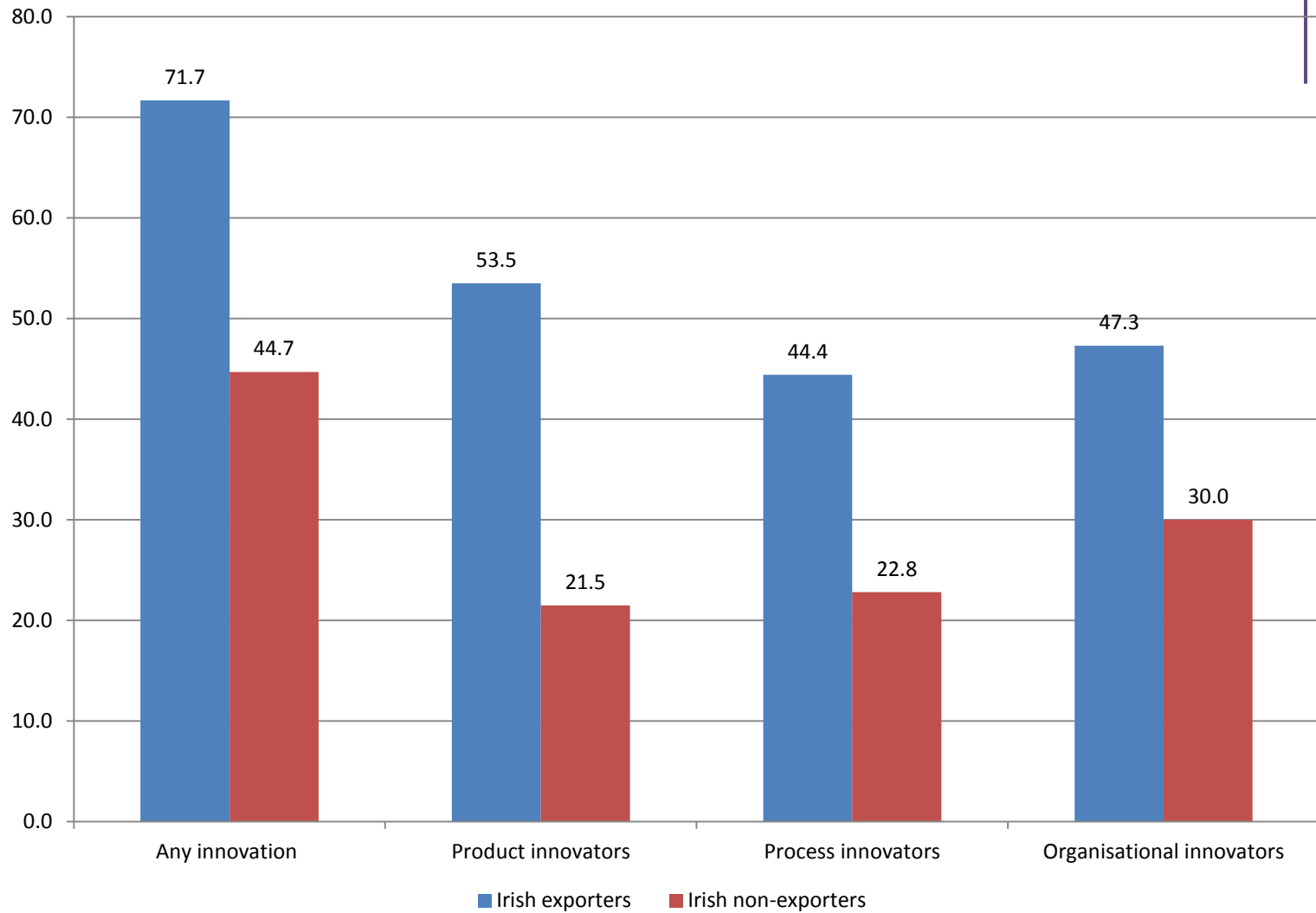
- **Focus on Indigenous Sector**
 - Market and systemic failures more likely
 - Essential to productivity, competitiveness, sustainable growth
 - Crucial to strengthening national innovation system

% of Firms with Innovation Activities, Ireland



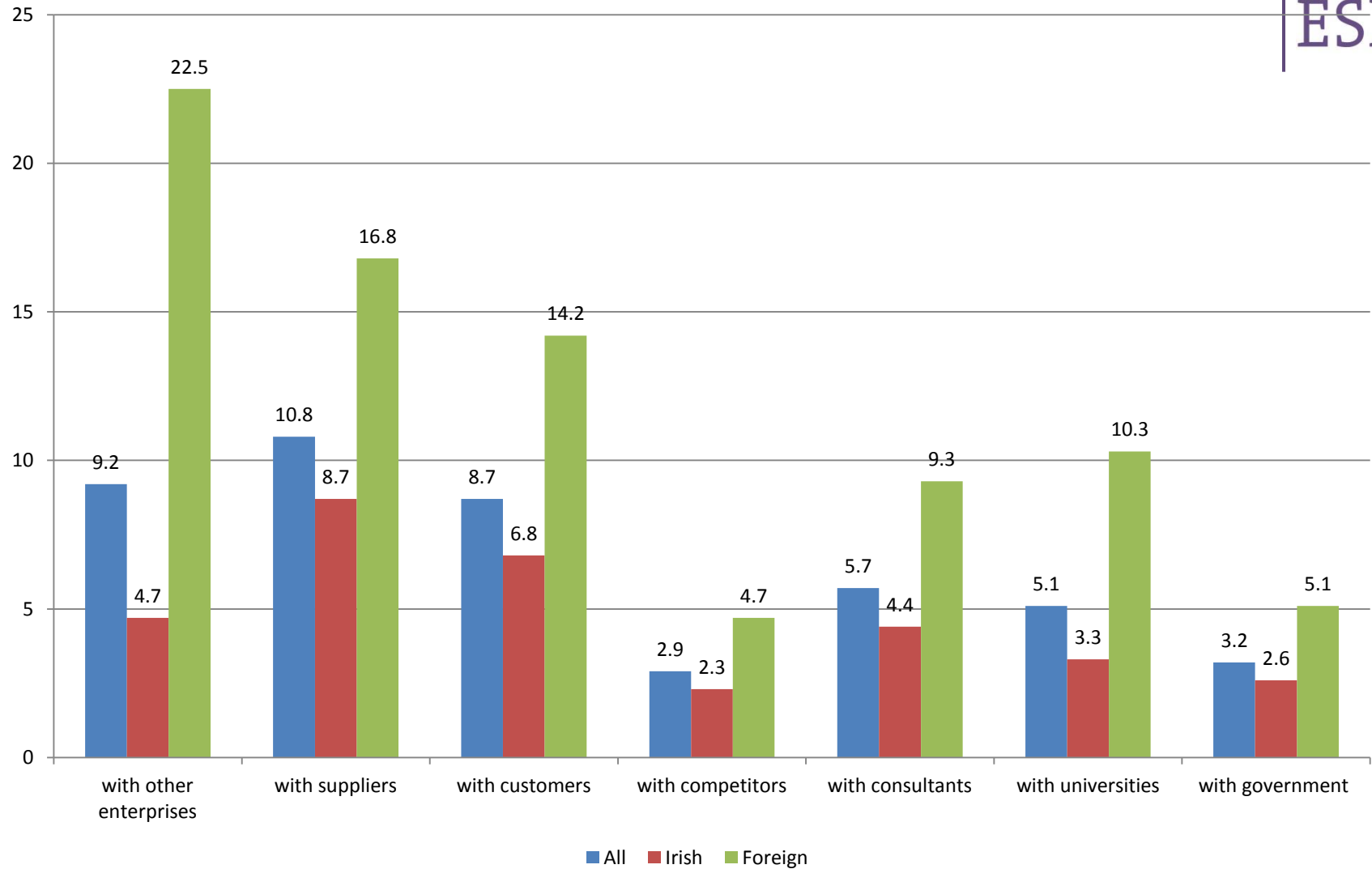
Data Source: CSO, Community Innovation Survey, 2004-2006

% of Irish Firms with Innovation Activities



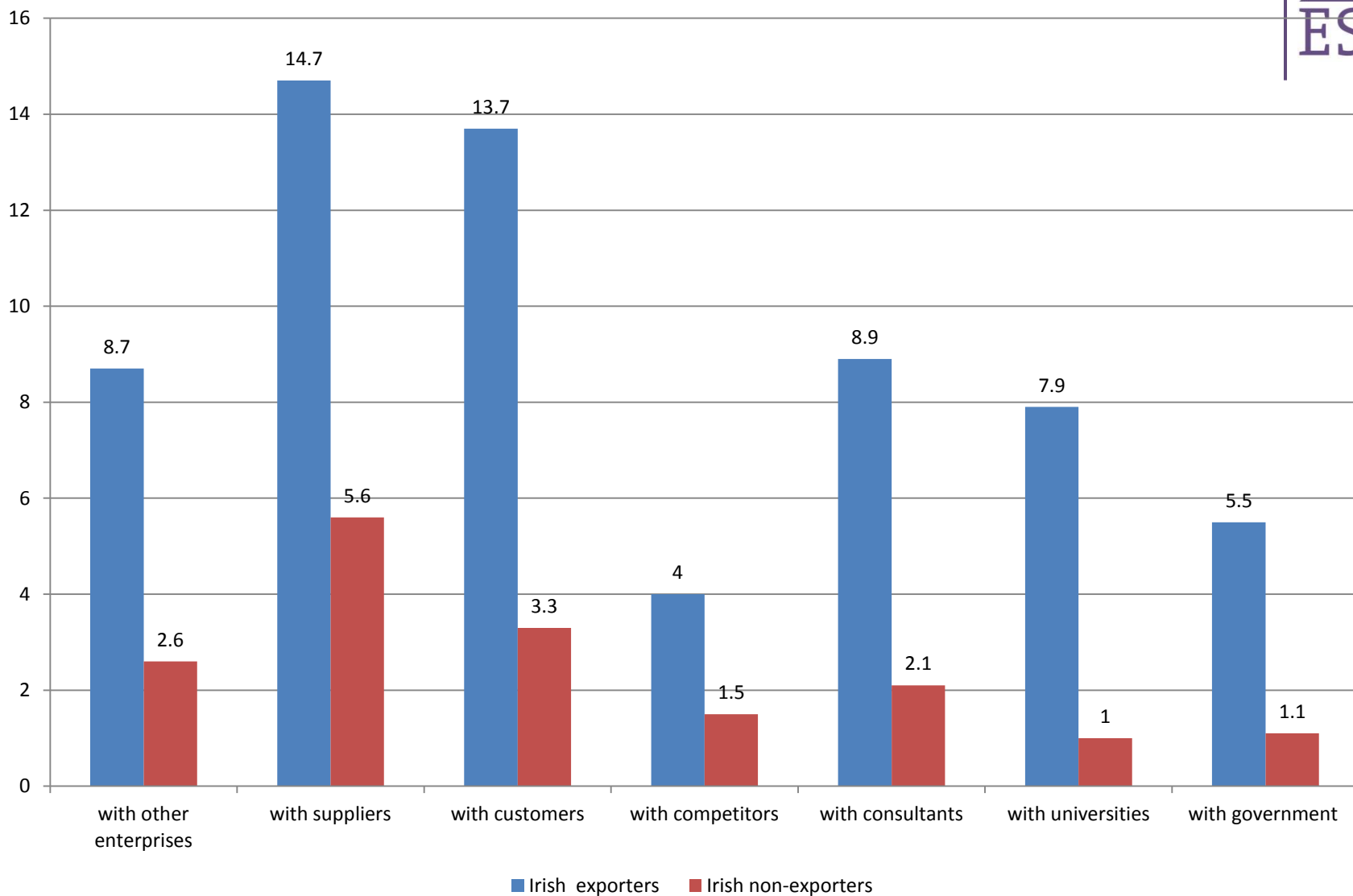
Data Source: CSO, Community Innovation Survey, 2004-2006

% of firms engaged in co-operation for innovation



Data Source: CSO, Community Innovation Survey, 2004-2006

% of Irish firms engaged in co-operation for innovation



Data Source: CSO, Community Innovation Survey, 2004-2006

Innovation and Productivity in Indigenous Enterprises



- Link between productivity and innovation especially process and organisational innovation
- Evidence supports government focus on innovation at enterprise level
- **Policy Issue**
 - Innovation supports should be cost-effective

Which Indigenous Enterprises Invest in Innovation?

- Larger enterprises
- Exporters
- Key Policy Instruments:
 - Stimulation grants for SMEs
 - Equity for high-potential start ups
 - Export and Development supports
- **Policy Issue**
 - Multiple supports raise evaluation issues

Which Indigenous Enterprises Have Higher Investment Rates?



- Size is not crucial
- Enterprise innovation capacity matters
- Key Policy Instruments:
 - R&D grants for expanding innovation activities
 - Contribution to Irish VC funds
- **Policy Issue**
 - Enterprises need innovation capacity

Which Indigenous Enterprises Innovate Successfully?



- Larger enterprises (process/organisational)
- Smaller enterprises (product innovation sales)
- Exporters (process/organisational)
- Enterprises that cooperate in innovation activities
- **Policy Issues**
 - Product innovation appears weak
 - Appropriate metrics and methodologies needed to measure innovation outcomes

Focus of Policy Interventions



| | Intensive Exporter | Modest Exporter | Non-Exporter |
|---------------------|--------------------|-----------------|--------------|
| Intensive Innovator | | | |
| Modest Innovator | | | |
| Non-Innovator | | | |

What can government policy do to promote innovation?



- **Improve ‘framework conditions’**
e.g., competition and regulation
- **Deal with market failures**
e.g., knowledge spillovers
- **Address systemic failures**
e.g., suboptimal networking
- **Avoid government failures**
e.g., overly complex interventions

Improve Framework Conditions

- Stable macroeconomic environment
- Openness to international trade and investment
- Competitive local product/service markets
- Flexible labour markets
- High level of financial development
- Well-performing education system
- High-performing infrastructure
- Protection of intellectual property rights *OECD (2010)*

Address market and systemic failures

- **To address market failures**

- Externalities - knowledge spillovers
- Static and dynamic economies of scale
- Information asymmetries

- **To address systemic failures**

- Incompatible incentives for market/non-market institutions
- Institutional rigidities, communication gaps
- Lack of networking and mobility of personnel
- Capability failures
- International dimensions of STI

But market failures may not justify government intervention OECD 2010b

Innovation Policy Mix: Policies to support Science, Technology and Innovation 1



● *Private Sector*

- Support investment in private sector STI
 - R&D grants, R&D tax credits, etc.
- Enhance innovation competencies of enterprises
 - Training grants, mentoring supports, etc.

Innovation Policy Mix: Policies to support Science, Technology and Innovation 2



● *Public Sector*

- Support investment in public sector STI
 - Supports for Infrastructure, competitive funding and strategic funding
 - Supports for the HE sector
 - Supports for publicly-funded research centres

Innovation Policy Mix: Policies to support Science, Technology and Innovation 3



● *System*

- Strengthen linkages within innovation system
 - Supports for inter-enterprise linkages, inter-institutional linkages, business-higher education linkages
 - Supports for international linkages

Conclusions

- Early stage of research based on micro data
- Ireland broadly in line with international evidence
- Important to collect data to monitor performance
- **Key Policy Messages**
 - Enabling policies are important
 - Enterprises' capacities to absorb new knowledge need enhancement
 - Account needs to be taken of innovation complexity and policy mix in evaluations